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AIR MARKING

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AIR MARKING

The general use of a standard system of air marking that will convey the necessary information to pilots in the simplest and most effective manner is one of the most immediately needed aids to air navigation at the present time. It is important that every city, town, and hamlet be adequately air marked.

The system of air marking presented in this bulletin is recommended by the Department of Commerce for use throughout the United States. This system is the result of extensive studies and service tests made by a special committee organized to study the subject of airway marking and to recommend a standard system of air marking for general use in this country. The committee was made up of representatives of the Aeronautics Branch of the Department of Commerce, the Army Air Corps, the Bureau of Aeronautics of the Navy Department, and the National Airway Marking Association.

GENERAL REQUIREMENTS FOR AIR MARKINGS

The markings should be as simple as possible consistent with the information to be conveyed, should be of such size and color as to insure maximum attractive power and visibility under all atmospheric conditions, should be easily legible from an average altitude of flight, and should be so illuminated as to be equally as effective by night as by day. They should be of a permanent nature, economical to construct and maintain, and should be placed in accordance with a fairly definite system in order that pilots may know where to expect them.

It is important that the markings give the pilot his position and enable him to orient himself; also that they indicate the direction and distance to the nearest landing field, the size of the field and the general equipment and facilities available, including facilities for night operation. Hence, it is recommended that, when possible, they include the name of the city or locality, a meridian marker, and, if there is an airport in the vicinity, a combination of simple characters indicating the direction and distance to the airport, the rating of the port, and whether facilities are available for landplanes, seaplanes, or both.

COLOR COMBINATION AND SIZE AND STYLE OF LETTERING

The effective reading distance of air markings depends upon the size and shape of the letters or characters used, their spacing, and the degree of contrast between the characters and the background. Best results are obtained by using the lighter color for the characters and the darker color for the background, particularly when the markings are to be illuminated for night operations. Tests that have been made indicate that in general chrome yellow characters on a dead black background are the most effective. However, either chrome yellow or international orange (see yellow No. 4. and orange yellow No. 5, respectively, of Color Card Supplement to U. S. Army Quartermaster Corps Specification No. 3–1) characters used in combination with a dead black background are very effective.

The height of lettering used for the name of the city or town should be from 10 to 30 feet, as available space may permit. Under no circumstances, however, should the lettering be less than 6 feet in height. If suitable roof area is not available to accommodate the complete name of the community in letters of ample size, it is more desirable that a clear abbreviation be used than to reduce the size of the lettering.

It is recommended that plain vertical gothic Capital lettering, as illustrated in Figures 1 (*a*) and 1 (*b*), be used in all air marking. (The unit of measure of gothic lettering, sometimes called Egyptian or block lettering, is one-seventh of the height. The thickness of all strokes is one unit, the curved strokes being the same thickness as the straight.) If more convenient, plain vertical block capital lettering, made up entirely of straight strokes and of the same proportions, may be used. The spacing between the letters should be not less than one-fourth of the letter height.

MERIDIAN MARKER

The form and proportions of the symbol recommended for the meridian marker (true north marker) are shown in Figure 2 (*k*). The letter " N " used in this symbol should be from 6 to 12 feet in height as space may permit, the over-all length of the marker being from six to seven times this letter height.

AIRPORT POINTER

The combinations of characters recommended for standard use for airport and landing-field pointers are shown in Figures 2 (*a*) to 2 (*j*), inclusive. Figure 2 (*a*) gives in detail the proportions recommended for this symbol. It will be noted that this marking consists of a circle (the standard symbol for an airport or landing field) with an arrow and figure indicating the direction and mileage to the airport and with suitable lettering within the circle giving the rating of the airport, or, if unrated, the class of the airport or landing field. In the case of seaplane airports the letter " S " precedes the circle, as shown in Figure 2 (*b*). For landplane airports offering seaplane facilities the letters " LS " precede the circle, as shown in Figure 2 (*c*), the rating within the circle being that of the landplane airport. The " US " shown above the circle in this figure is used for airports that have been designated by the Federal Government as airports of entry of the United States. Pointers indicating seaplane airports with facilities for landplanes should have the letters " SL " preceding the circle, as shown in Figure 2 (*d*), the rating within the circle being that of the seaplane port. Airport pointers used to indicate unrated municipal airports, unrated commercial airports, unrated private airports, Federal airdromes or air stations, Department of Commerce

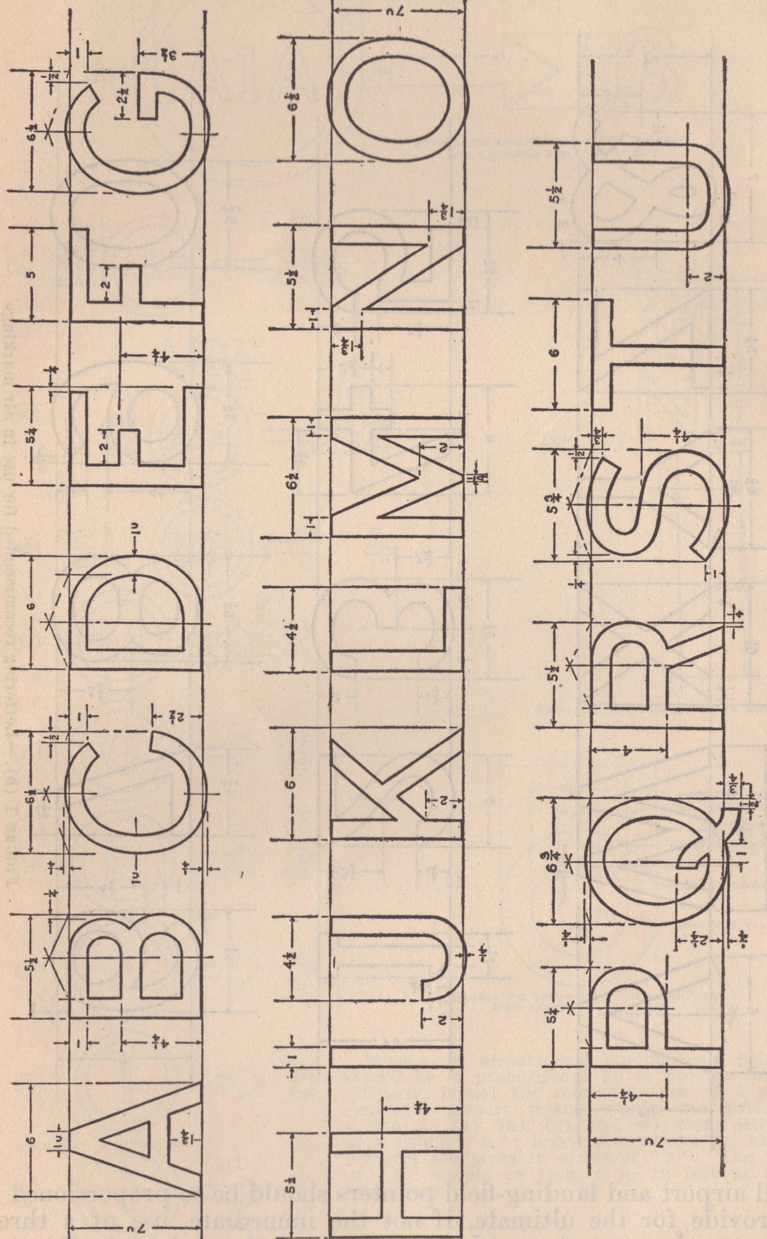

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
6
5½
6½
6
5¼
5
6½
5½
1
4½
6
4½
6½
5½
6½
5¼
6¾
5½
5¾
6
5½
7u
4½
3¾
2½
2
1u
1

FIGURE 1 (*a*).—Lettering recommended for use in air markings intermediate landing fields, or marked auxiliary fields should use the letters "M," "C," "P," "F," "I," or a Greek cross, as shown in Figures 2 (*e*) to 2 (*j*), respectively.

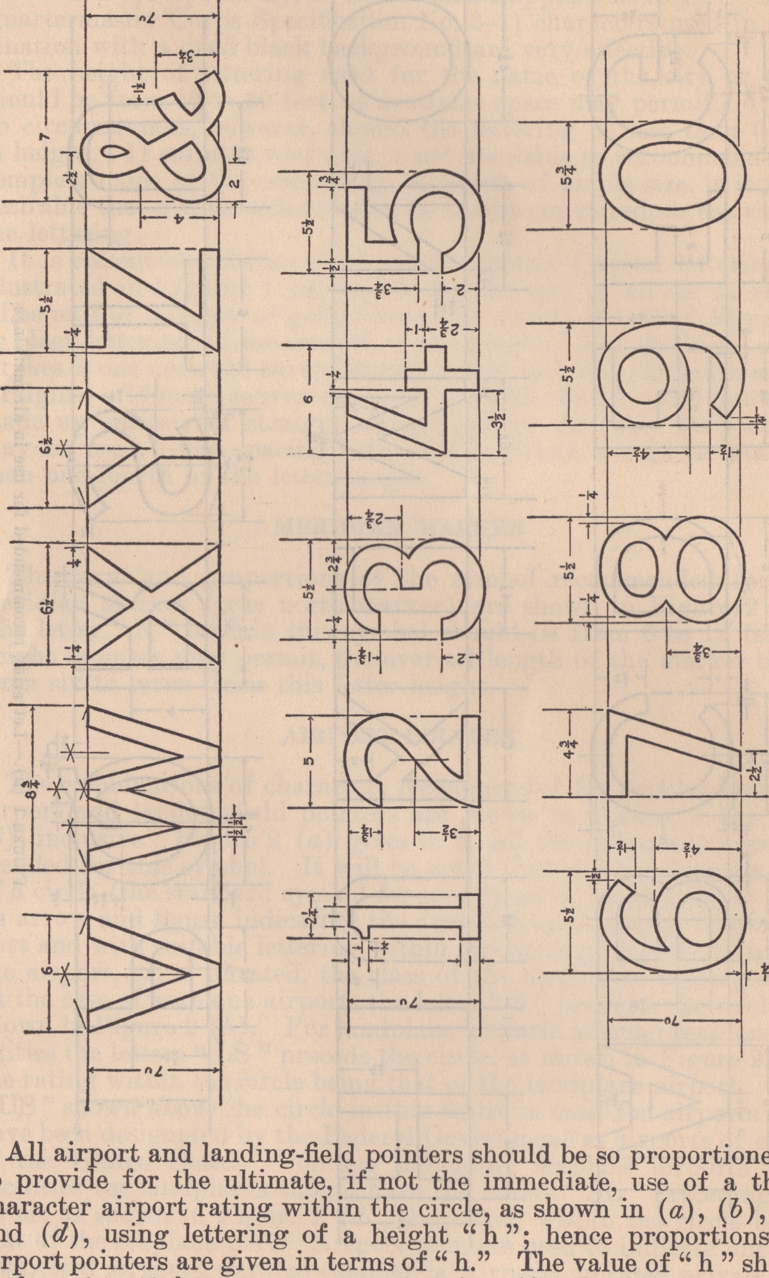
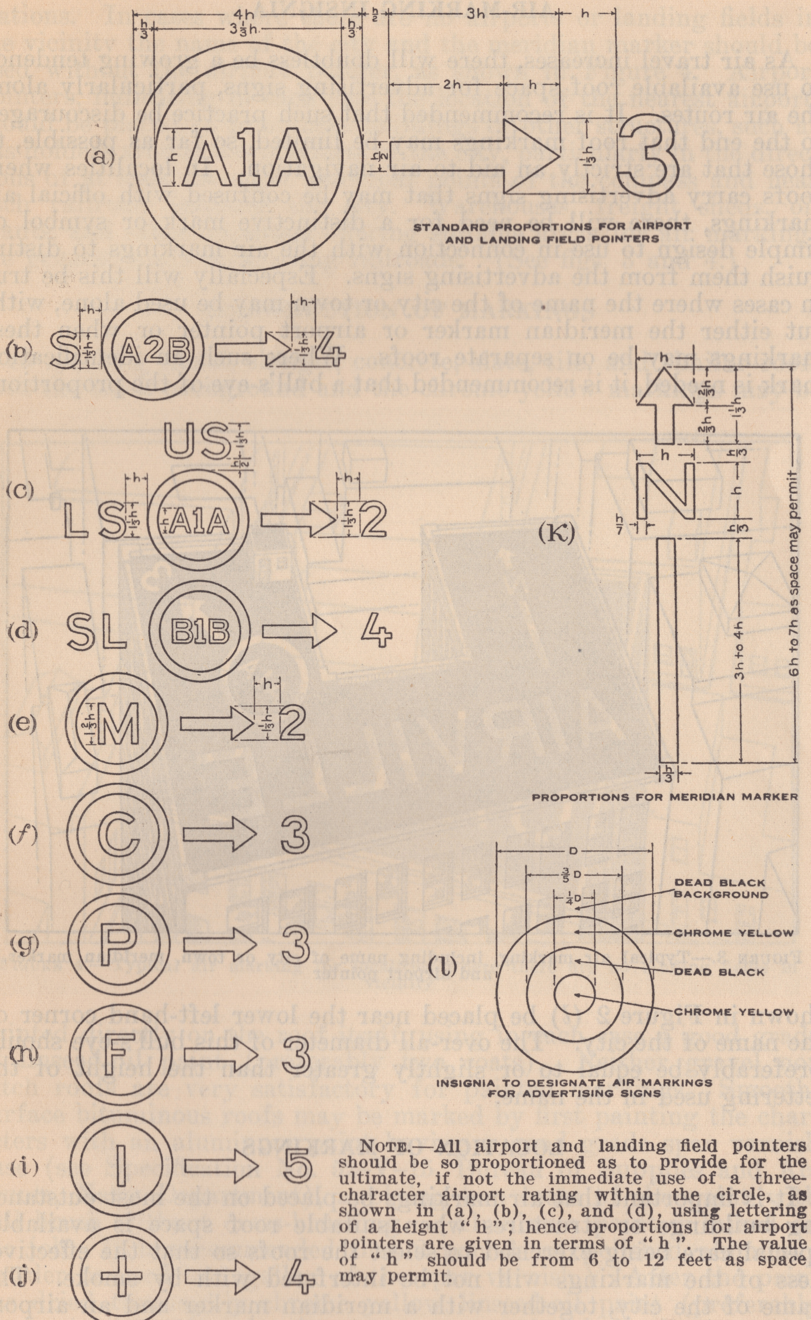


FIGURE 1 (*b*).—Lettering recommended for use in air markings

All airport and landing-field pointers should be so proportioned as to provide for the ultimate, if not the immediate, use of a three-character airport rating within the circle, as shown in (*a*), (*b*), (*c*), and (*d*), using lettering of a height "h"; hence proportions for airport pointers are given in terms of "h." The value of "h" should be from 6 to 12 feet, as space may permit. (See fig. 2 (*a*).)


(a)
4h
h/3
3 1/3 h
h/3
h/2
3h
h
2h
h
A1A
h
h/2
1 1/3 h
3
STANDARD PROPORTIONS FOR AIRPORT AND LANDING FIELD POINTERS
(b)
S
1 1/3 h
h
A2B
h
1 1/3 h
4
(c)
US
1 1/3 h
h/2
LS
h
1 1/3 h
h
A1A
h
1 1/3 h
2
(d)
SL
B1B
4
(e)
2/3 h
M
h
1 1/3 h
2
(f)
C
3
(g)
P
3
(h)
F
3
(i)
I
5
(j)
+
4
(K)
h
2/3 h
2/3 h
1 1/3 h
h
h/3
h
h/3
h/3
N
3h to 4h
6h to 7h as space may permit
h/3
PROPORTIONS FOR MERIDIAN MARKER
(l)
D
3/5 D
1/4 D
DEAD BLACK BACKGROUND
CHROME YELLOW
DEAD BLACK
CHROME YELLOW
INSIGNIA TO DESIGNATE AIR MARKINGS FOR ADVERTISING SIGNS

NOTE.—All airport and landing field pointers should be so proportioned as to provide for the ultimate, if not the immediate use of a three-character airport rating within the circle, as shown in (a), (b), (c), and (d), using lettering of a height " h "; hence proportions for airport pointers are given in terms of " h ". The value of " h " should be from 6 to 12 feet as space may permit.

FIGURE 2.—Airport and landing field pointers, meridian marker, and insignia for distinguishing official air markings from advertising signs

AIR-MARKING INSIGNIA

As air travel increases, there will doubtless be a growing tendency to use available roof space for advertising signs, particularly along the air routes. It is recommended that such practice be discouraged to the end that roof markings may be limited, so far as possible, to those that are strictly an aid to air navigation. In localities where roofs carry advertising signs that may be confused with official air markings, there will be need for a distinctive mark or symbol of simple design to use in connection with the air markings to distinguish them from the advertising signs. Especially will this be true in cases where the name of the city or town may be used alone, without either the meridian marker or airport pointer or when these markings may be on separate roofs. Where such an identification mark is needed, it is recommended that a bull's-eye of the proportions shown in Figure 2 (*l*) be placed near the lower left-hand corner of the name of the city. The over-all diameter of this bull's-eye should preferably be equal to or slightly greater than the height of the lettering used in the name.

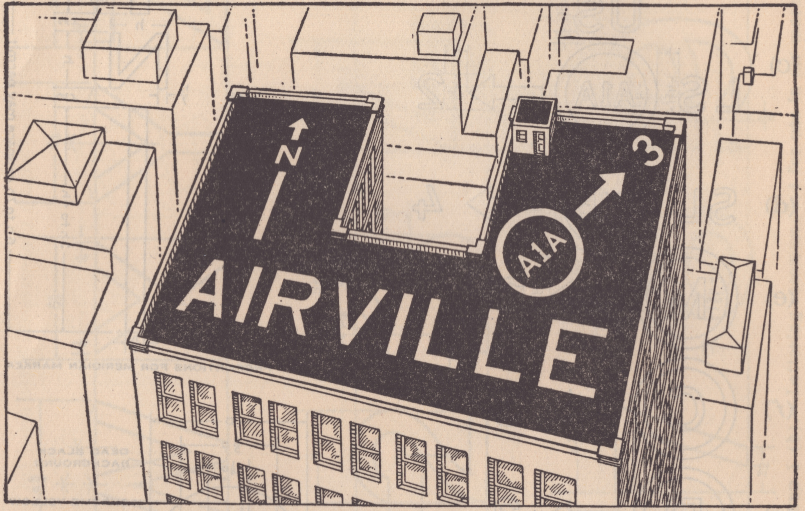


FIGURE 3.—Typical air marking, including name of city or town, meridian marker, and airport pointer

LOCATION OF MARKINGS

It is important that air markings be placed on the most outstanding buildings or structures when suitable roof space is available, special care being exercised to select the roofs so that the effectiveness of the markings will not be interfered with by smoke. The name of the city, together with a meridian marker and an airport pointer, as shown in Figure 3, should be placed on one or more suitable roofs near the center of the city for the smaller cities and towns and at or near the center of each section of the city for the larger cities. It is also very helpful if such markings are placed at railroad stations. In cases where there are no airports or landing fields in the vicinity the name of the city and the meridian marker should be used without the airport pointer, as shown in Figure 4. Airport pointers, indicating in each case the location of the nearest airport, should be placed on prominent buildings or other structures, such as gas holders around the outskirts of the city, particularly in the directions of at least the eight principal points of the compass and near each railroad entering the city. Warehouses, freight sheds, oil plants, and other buildings offering suitable areas for air markings are generally available along railroads. (See figs. 3 and 4.)

CONSTRUCTION OF MARKINGS

In marking metal, shingle, concrete, slate, tile, and similar roofs both the black background and the chrome yellow markings may be painted directly on the roof itself, using in each case a good grade of linseed-oil paint (preferably two coats). Neither gravel nor pitch roofs are very satisfactory for painted markings. Smooth-surface bituminous roofs may be marked by first painting the characters with an aluminum paint having a good grade spar varnish base (see Specification No. 52–V–15, Bureau of Supplies and Accounts, Navy Department), applying two coats of the paint with full brush without cross-brushing. (Aluminum paint is mixed on the job. It is recommended that 2 pounds of polished aluminum powder be used to 1 gallon of the spar varnish.) After the paint has dried thoroughly chrome yellow linseed-oil paint (preferably two coats) is applied, leaving a narrow margin of aluminum outside of the chrome yellow to prevent "bleeding." It is very difficult, however, to avoid a certain amount of bleeding in markings painted on bituminous roofs. (See fig. 5.)

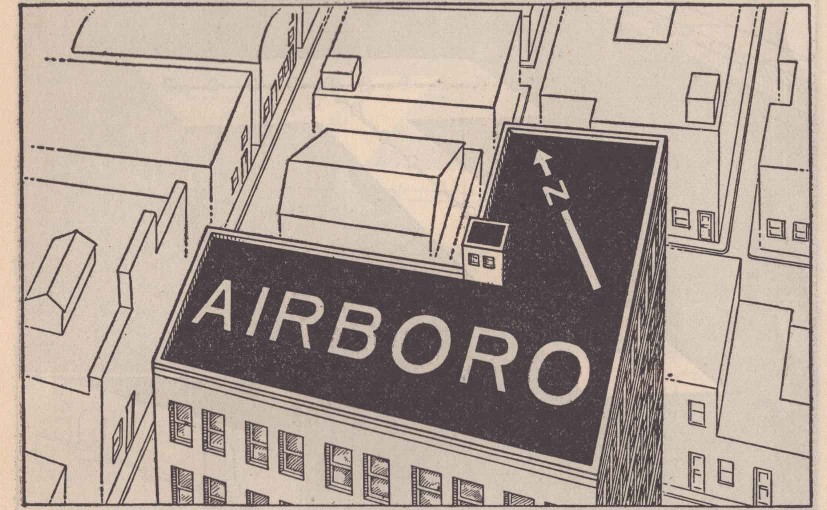


FIGURE 4.—Typical air marking for localities where there are no landing fields in vicinity

Another method of marking is to use characters constructed of painted galvanized iron or other rust-resisting metal, of baked porcelain-enameled metal, or of other suitable material, and placed flat on the roof or mounted above the roof on suitable supports. Where necessary, the roof should be treated in such a manner as to afford a dead-black background. In the case of gable roofs having a slope in excess of 30° the markings should be placed on both sides of the roof.

Raised markings have a definite advantage, as those painted or placed directly on the roofs of flat-topped buildings are very likely to become covered with dirt or soot and in the winter to be blanketed with snow. When raised markings are used they should be mounted at sufficient height above parapets and fire walls to be above snowdrifts and to be swept by a free blast of wind.

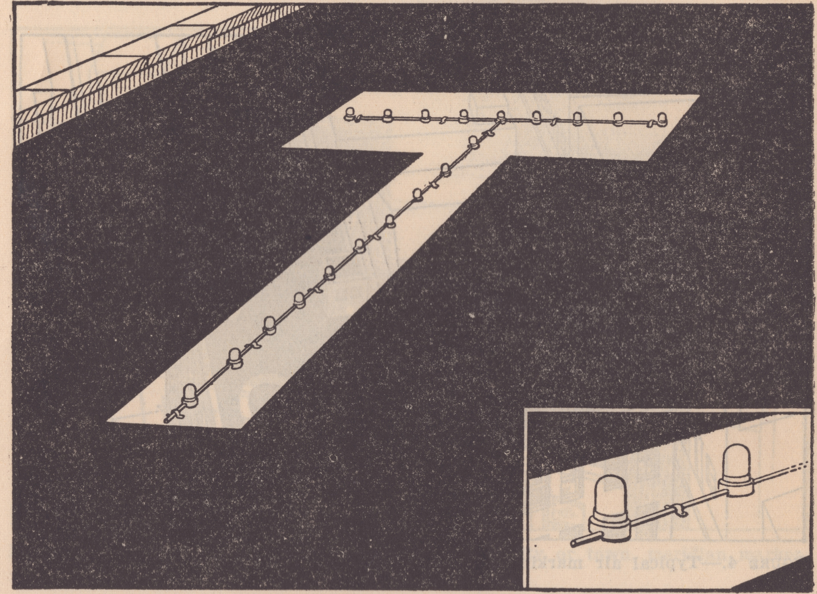


FIGURE 5.—Flat letter illuminated with exposed incandescent lamps

Figure 6 illustrates a suggested method of constructing raised letters. It will be noted that the sides of the strokes have been sloped slightly to shed dust and dirt and to facilitate washing off by rain. This slope should not exceed 30°

ILLUMINATION OF MARKINGS

In order that air markings may serve their full purpose, they should be illuminated for night flying. The problems involved in illuminating such markings are fundamentally the same as those encountered in illuminating large advertising signs, except that the former are horizontal instead of vertical.

There are three general systems of illumination that are applicable to air markings, as follows:

1. By reflected light, in which either flood-light projectors with spread lenses (and, when necessary, with shields or visors to cut off stray upward light) or industrial reflectors are so arranged as to give a uniform distribution of light of proper intensity over the entire surface of the marking.
2. By transmitted light, in which incandescent lamps are mounted under translucent glass strips of suitable color arranged to form the letters or symbols.
3. By direct light, in which the markings are outlined by exposed incandescent lamps or by gaseous discharge tubes, preferably placed along the center line of the strokes of the lettering and other symbols. (The markings may be made up of suitable colored reflecting surfaces giving good day visibility and which for night operation are illuminated by the exposed lamps, thus augmenting the effect of the lamps.)

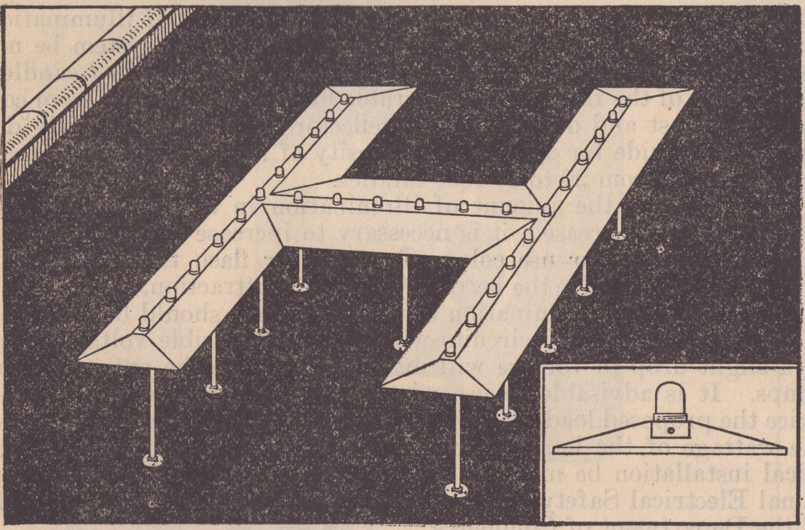


Figure 6.—Construction of raised letter with exposed incandescent lamp illumination

Illumination by direct light is the most effective owing to greater brilliance and hence greater attracting power. Markings illuminated in this manner are effective at night even though the color of the characters is obscured by dirt or snow. The conduit and fittings for either exposed incandescent lamps or gaseous discharge tubes may be fastened flat on the roof with metal conduit straps, as illustrated in Figure 5, which shows a letter illuminated with exposed incandescent lamps with weatherproof hoods, or strapped to light stringers superimposed on the markings. The conduit and fittings and the stringers, when used, should be painted the same color as the markings. For raised letters the conduit may be installed as shown in Figure 6.

For outlining with incandescent lamps not less than 10-watt clear sign lamps should be used, and lamps should be spaced from 8 inches apart for 6-foot letters to 12 inches apart for 12-foot letters or larger. Unless there is a large amount of competing light in the vicinity of the marking, the 10-watt lamps give better legibility than lamps of higher wattage. In case it is desired to use colored lamps with a brilliance corresponding to the 10-watt clear sign lamps, 15-watt lamps should be used for yellow and 25-watt lamps for green and red. (The colored lamps must necessarily be of higher wattage on account of the absorption of some of the light by the colors.) In case the outline lighting is done with gaseous discharge tubes, either 11-millimeter by 18-milliampere or 15-millimeter by 25-milliampere tubing is recommended.

Markings illuminated by transmitted light, with their unlighted background, are very effective by night. However, their current consumption is usually quite high, and they are not, as a rule, very satisfactory by day.

The reflected light system of illumination is the simplest to install and gives very good results if the markings are kept clean and free from snow but does not have the attracting power of the other systems. It is recommended that the average intensity of illumination on the surface of the markings for the reflected light system be not less than 10 foot-candles and preferably not less than 15 foot-candles. On account of the fact that considerable loss of light results from collection of dust and dirt on lamps, reflectors, etc., it is generally desirable to provide for an average intensity of illumination with clean equipment of from 20 to 25 foot-candles.

In general, as the amount of illumination in the vicinity of the air marking is increased, it is necessary to increase the brilliance of the marking, and/or use color effect, and/or flash the marking in order that it may have the necessary power of attraction.

In planning the illumination of markings care should be exercised to provide well-divided circuits with the least possible voltage drop, as a slight drop in voltage will materially reduce the output of the lamps. It is advisable to use wire of ample size to carry at least twice the proposed load, as it may later be found necessary to increase the wattage of the lamps. It is recommended that the entire electrical installation be made in accordance with the rules of the National Electrical Safety Code, published by the Bureau of Standards of the Department of Commerce.

ROUTE MARKINGS

It is often desirable, particularly at airports, to provide markings indicating the routes or directions to other cities; also, to place markings at suitable points outside of a city to indicate the direction to that city. In such cases it is recommended that the name of the city be placed inside of a directional arrow of outline form, as shown in Figure 7. The mileage may be indicated by figures placed within the head of the arrow in the manner illustrated in Figure 8.

HIGHWAY MARKINGS

Highways stand out very clearly when viewed from the air, and hence are one of the pilot's best landmarks. When properly marked to facilitate their identification, these arteries of motor travel (particularly the major routes, both Federal and State) constitute a very helpful aid to air navigation. Therefore, it is urged that the air marking of highways be undertaken wherever possible.

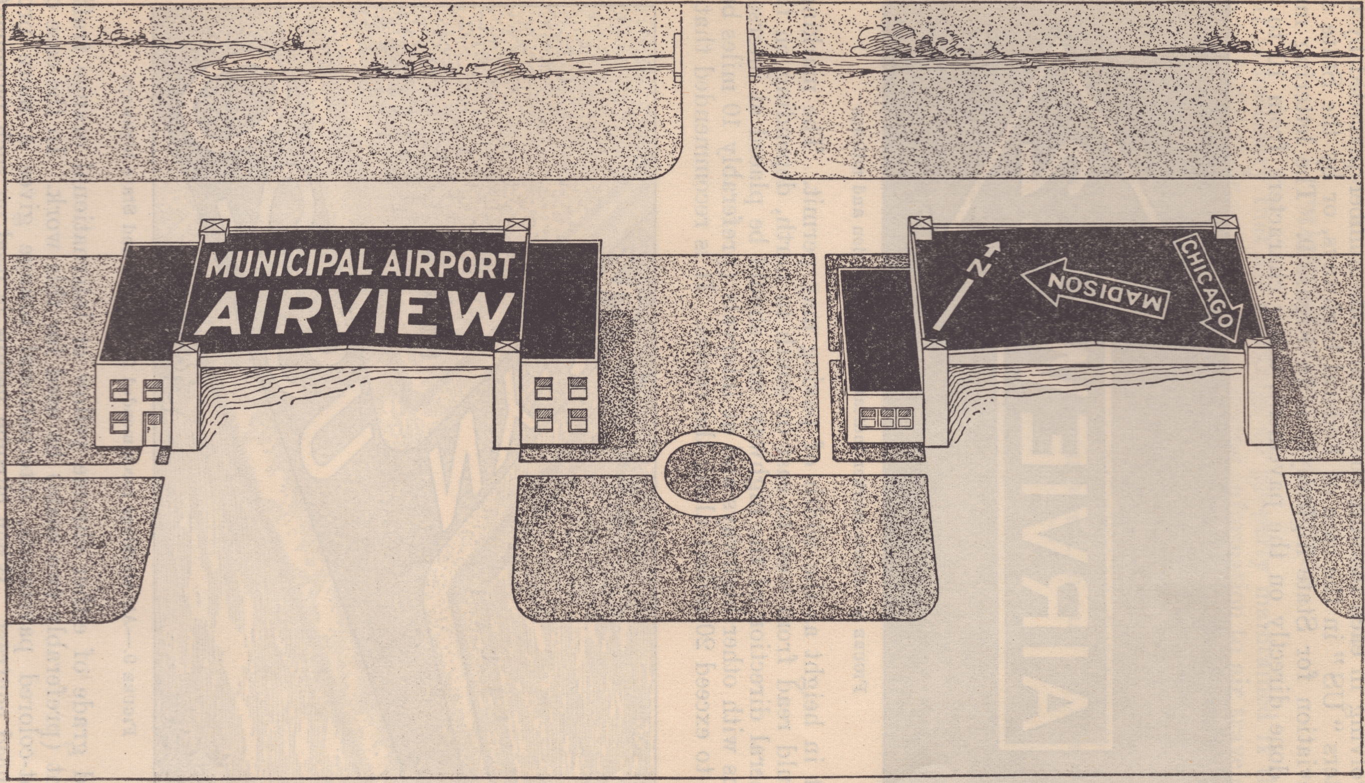

MUNICIPAL AIRPORT
AIRVIEW
N
MADISON
CHICAGO

FIGURE 7.—Typical hangar roof markings showing route arrows

The markings recommended for this purpose are very simple, involving in each instance the official route number preceded by the letters "US" in the case of Federal highways, or by the State abbreviation for State highways, as in Figure 9. The lettering may be done directly on the pavement, using characters from 10 to 30 feet in height as the width of paving may permit. The markings should read from west to east or south to north, depending on the general direction of the highway, and should be placed at intersections with other highways and at intervals (preferably 10 miles but not to exceed 20 miles) along the routes. It is recommended that a good grade of either chrome yellow or international orange traffic paint (preferably two coats) be used for this work. In the case of light-colored pavements, international orange gives a more pronounced contrast. When chrome yellow is used on such pavements the characters are frequently outlined in black. In lieu of placing

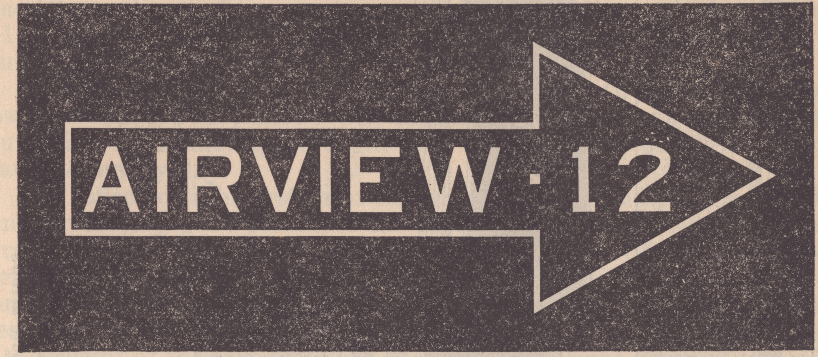


FIGURE 8.—Route marker indicating both direction and mileage

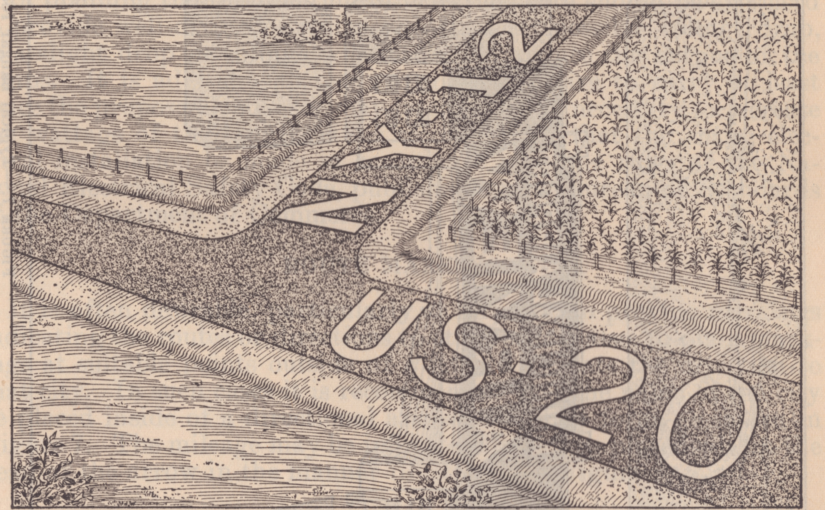


FIGURE 9.—Air markings recommended for Federal and State highways

highway markers directly on the pavement, they may be constructed in suitable manner alongside thereof if such is desired.

MAINTENANCE OF MARKINGS

It is necessary that air markings be properly maintained if they are to fulfill their purpose of conveying information to air travelers. The markings should be swept or washed from time to time as may be necessary to keep them free from the accumulation of soot or dirt in order to preserve the contrast between markings and background and insure maximum legibility. Arrangements should be made for such periodic repainting as local conditions may dictate; also, for the proper maintenance of lighting equipment in case the markings are illuminated for night flying.

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